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Rev. 0

100-D Area Chromium Study Summary Report

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100-D Area Chromium Study Summary Report

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Date Published

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ACRONYMS

BHI	Bechtel Hanford, Inc.
COC	contaminant of concern
DOE	U.S. Department of Energy
Ecology	Washington State Department of Ecology
EMI	electromagnetic induction
ERC	Environmental Restoration Contractor
FSWM	Field Services Waste Management
GPR	ground penetrating radar
GPS	global positioning system
LIBS	laser-induced breakdown spectroscopy
ppb	parts per billion
ppm	parts per million
RL	U.S. Department of Energy, Richland Operations Office
SAI	Sampling and Analysis Instruction
WAC	*Washington Administrative Code*
WIDS	Waste Information Data System

1.0 INTRODUCTION

The presence of chromium in Columbia River substrate pore water samples collected adjacent to the 100-D Area in 1995 has elevated interest in potential contamination sources to area groundwater and the river. Assessments by the groundwater project have identified possible sources of the chromium in the 100-D Area based on sample results from area wells, data modeling, and area process knowledge. These assessments, coupled with field observations made during 1995 and 1996 in the vicinity of the 190-D Complex, resulted in the development of sampling plans for chromium in soil at the former location of the 190-D Complex and associated facilities during 1997, as documented in this report.

1.1 PURPOSE

This summary has been prepared to document the activities performed in support of the 100-D Area chromium study. The purpose of the study was to determine the concentration of chromium in soil at suspected locations of elevated contamination at the following locations: (1) near the former 190-D Complex (Waste Information Data System [WIDS] waste site number 100-D-30), (2) at or near the former sodium dichromate tank location at the 108-D Building, (3) at or near the sodium dichromate pumping station (waste site number 100-D-12), and (4) along underground piping that interconnected the facilities. Drivers of the study included observation of yellow-stained soil that had been documented in the area and elevated levels of chromium detected in area groundwater and in Columbia River substrate pore water. A source of chromium contamination in soil was not identified as a result of the chromium study activities documented in this report.

1.2 SITE HISTORY/DESCRIPTION

The 100-D Area is made up of the 100-DR-1 and 100-DR-2 operable units. These operable units include liquid and solid waste disposal sites in the vicinity of, and related to, the 100-D and 100-DR reactors. A third operable unit, 100-HR-3, consists of groundwater that lies beneath the 100-D and 100-DR Reactor areas, the 100-H Reactor area, and the land in between them. The 100-D Area consisted of several major buildings, including the reactor building and numerous structures associated with the treatment and storage of reactor cooling water prior to its use. Most facilities were deactivated with the reactor buildings and have since been decommissioned and demolished.

Sodium dichromate was commonly used as a corrosion inhibitor in reactor coolant solutions. Stock solutions of 6 percent sodium dichromate were used and stored near the 190-D Complex, the sodium dichromate pumping station, and possibly the 108-D Building (Figure 1). The 190-D Building was attached to and considered a part of 185-D/189-D Building. During operation, the 185-D Building housed the sodium dichromate addition mix tank, pumps, and storage facilities for the 105-D Reactor. The sodium dichromate solutions were made from either dry-bagged or liquid materials. These materials were transferred from either rail tank cars or truck tank cars at a

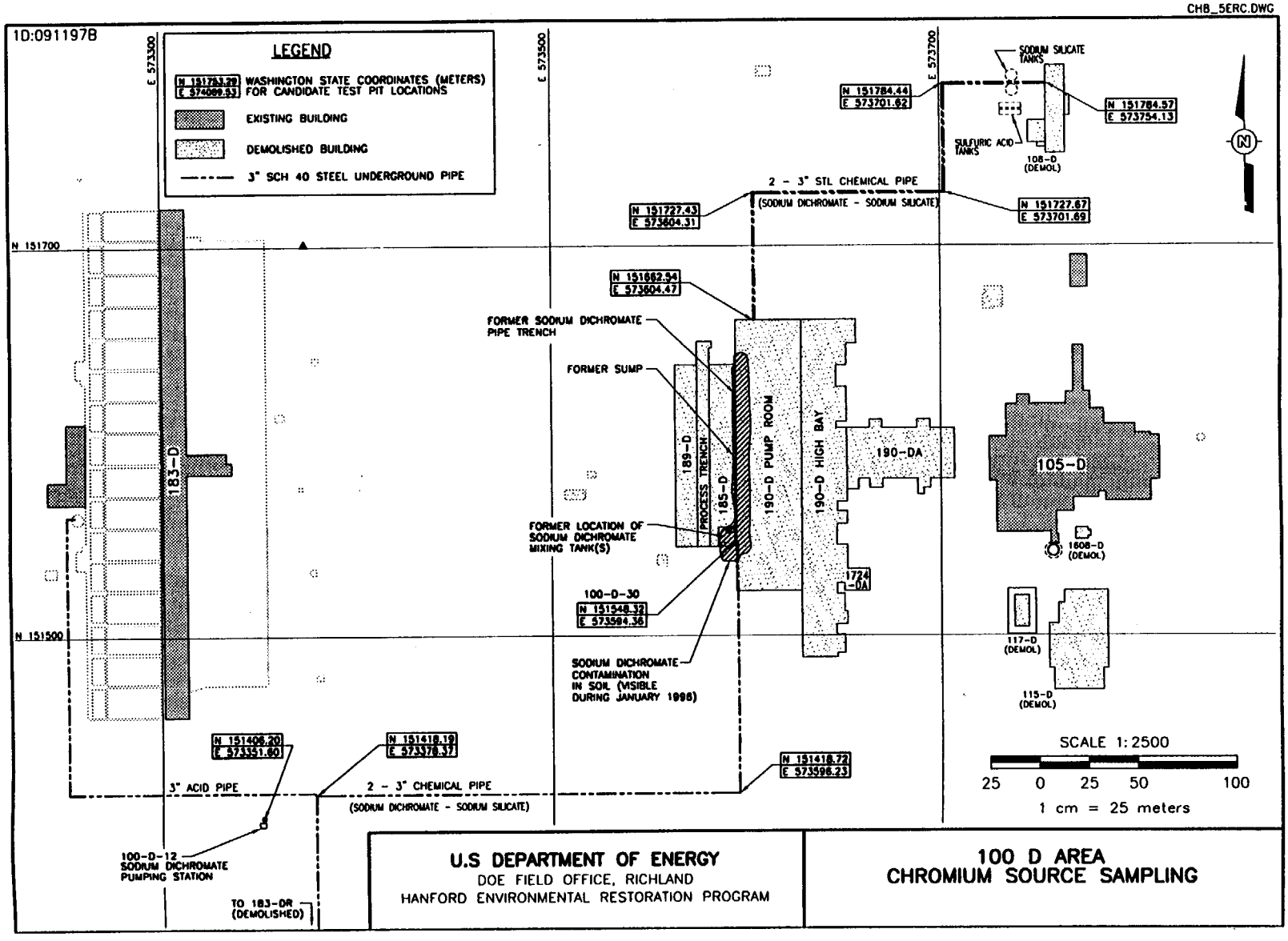


Figure 1. 100-D Complex.

pump station. The 190-D Complex was demolished from 1994 through 1996 and is part of the 100-DR-1 Operable Unit.

A sodium dichromate/acid pumping station was located south of the 183-D Building, next to the railroad tracks. An underground line, 7.6 cm (3 in.) in diameter, provided the ability to pump stock solutions to storage tanks located in the 185-D Building. A 0.9-m (3-ft)-diameter french drain located at the site supported the flushing and draining of hoses and lines that connected to the tank cars. Undiluted volumes of sodium dichromate and acid solutions were dumped directly into the soil column at this location. The pumping station is located within the 100-DR-2 Operable Unit.

Two sodium dichromate storage tanks were originally installed west of the 108-D office and equipment decontamination building and were connected to the 185-D Building by an underground line, 7.6 cm (3 in.) in diameter. The tanks were installed in accordance with the building's original intended purpose of chemical feeding for water treatment. The tanks were later removed from outside of the 108-D Building and reinstalled on the second floor in the southeast corner of the 185-D Building. It is unknown why the tanks were relocated, why the function of the 108-D Building was changed, or if stock solutions of sodium dichromate were stored in the tanks before they were relocated. The 108-D Building has been demolished and is part of the 100-DR-1 Operable Unit.

1.3 PREVIOUS INVESTIGATIONS

Information from previous activities in the 100-D Area related to chromium contamination in soil has been published in the following documents and reports (listed in reverse chronological order):

- *Chromium Plume West of the 100-D/DR Reactors – Data Supplement* (BHI 1997e), dated December 1997
- *190-D Complex GPS Survey* (FDO 1997), dated July 9, 1997
- *Assessment of the Chromium Plume West of the 100-D/DR Reactors* (BHI 1997a), dated June 1997
- *Final Group 3 Field Investigation Results and Remedial Design Recommendations* (BHI 1997b), dated May 5, 1997
- *Dichromate Stain at Site of 190-D Complex* (BHI 1996c), dated November 19, 1996
- *1907-DR Process Sewer Outfall Site Soil Characterization* (BHI 1996a), dated September 1996

- *Chromium in River Substrate Pore Water and Adjacent Groundwater* (BHI 1996b), dated September 1996

- *Update on Yellow Soil in 100-D Area* (BHI 1996d), dated June 17, 1996

- *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-DR-2 Operable Unit, Hanford Site, Richland, Washington* (DOE 1995), dated May 1995

- *Limited Field Investigation Report for the 100-DR-1 Operable Unit* (DOE 1994), dated June 1994.

Information from these sources was used to help formulate the sample design for this investigation.

1.3.1 Assessment of the Chromium Plume West of the 100-D/DR Reactors (BHI 1997a)

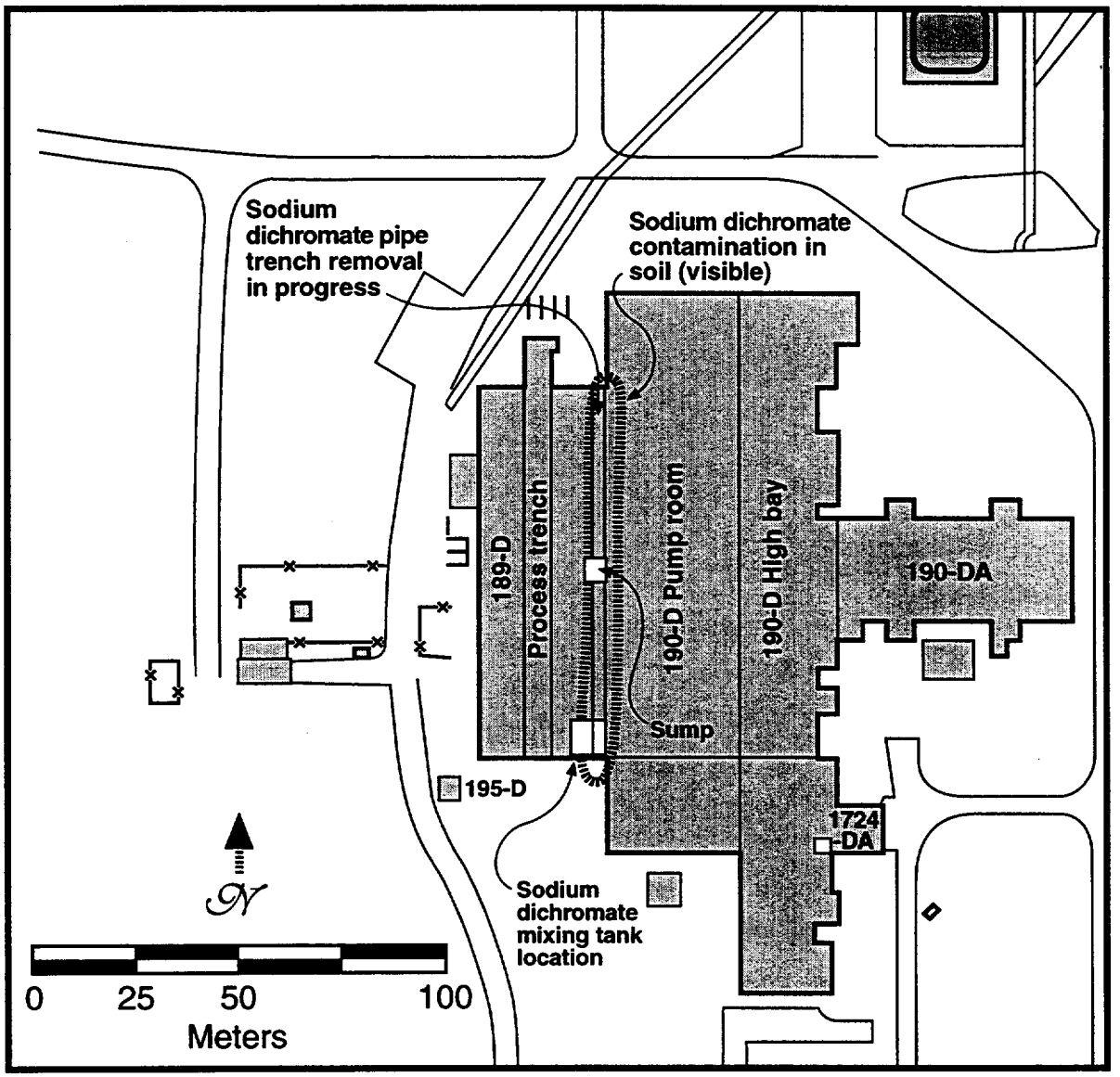
Sampling of the Columbia River substrate pore water in November 1995 revealed hexavalent chromium concentrations in excess of 630 ug/L (parts per billion [ppb]) in the riverbed offshore of the 100-D Area. Shoreline drive point sampling at multiple depths also revealed hexavalent chromium concentrations that increased with depth, to a maximum of 869 ug/L ppb at approximately 3.05 m (10 ft) below the water table. To answer unresolved questions about the elevated concentrations along the shoreline, a single groundwater well (199-D4-1) was drilled in October 1996, approximately 152 m (498.7 ft) inland from the drive point sample location with the highest concentration of hexavalent chromium (869 ug/L). Sample results from the new well indicated a hexavalent chromium concentration of approximately 1,030 ug/L ppb, and identified groundwater as the pathway for chromium contamination in the drive point and pore water samples.

In 1997, four additional boreholes were drilled. High chromium values were detected in three of the four wells. One well upgradient from 199-D4-1 was found to contain chromium at greater than 2,000 ug/L. Wells to the southwest and northeast of 199-D4-1 had groundwater concentrations of approximately 850 and 650 ug/L, respectively.

Possible sources of chromium in the groundwater were evaluated. Absence of radionuclide contaminants from the new well suggested a source of chromium that did not contain radionuclides as a co-contaminant. The high concentrations of hexavalent chromium found in the well also suggested that the contamination is the result of highly concentrated stock solutions used to make up the cooling water rather than from cooling water solutions (maximum concentration of 700 ug/L) that were used in the reactor. Of the known facility sources for chromium within the 100-D/DR Area, all sources were eliminated with the exception of those listed below:

- Sodium dichromate unloading/transfer station south of the 183-D Building
- 190-D Building sodium dichromate pipe trench
- Sodium dichromate storage tanks near the former 108-D Building.

Figure 2. Sodium Dichromate Pipe Trench at 190-D Complex.



1.3.2 190-D Complex GPS Survey (FDO 1997)

In January 1996, yellow discoloration of soil was observed at a depth of approximately 1.2 to 1.8 m (4 to 6 ft) during the removal of a sodium dichromate pipe trench at the 185-D Building (Figure 2). Removal of the trench was being performed as part of the 190-D Complex demolition. A global positioning system (GPS) survey was performed at the time to collect position information on the sodium dichromate trench with respect to the 185-D Building. The location has subsequently been assigned waste site number 100-D-30 in the WIDS.

1.3.3 Dichromate Stain at Site of 190-D Complex (BHI 1996c)

In November 1996, a large area of yellow discoloration was observed on the ground surface at the site of the demolished 190-D Complex. The surface discoloration was presumed to be the result of sodium dichromate that had migrated to the surface. The approximate sizes of the stained areas were determined using a measuring tape and a Brunton™ compass. The location of the stained areas corresponded to the location of sodium dichromate storage tanks in the 185-D Building and the area where discoloration was observed during demolition activities (Figure 3).

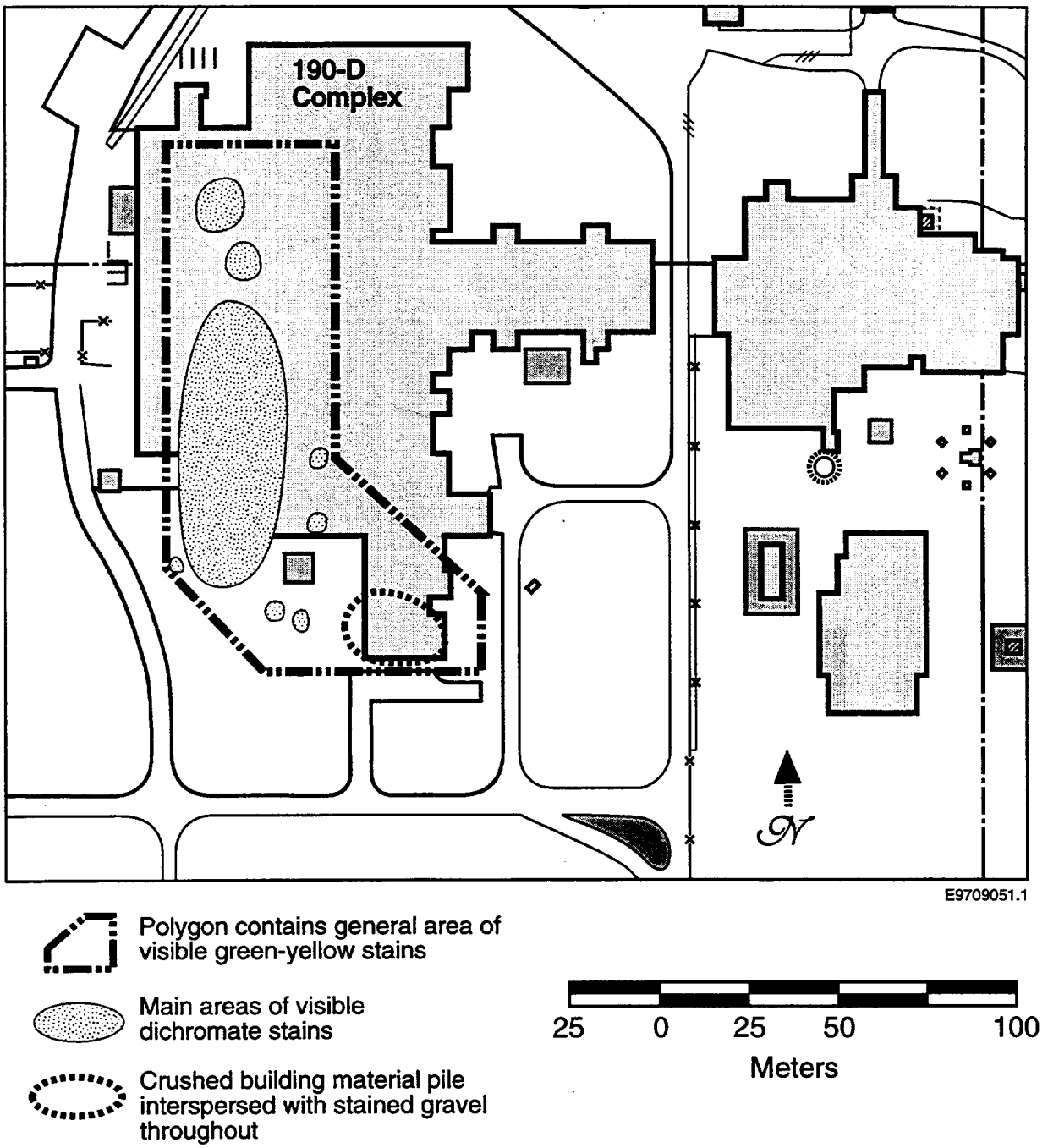
Earlier in the year, an informal sample was collected from the stained area and tested using a water extraction method to prepare the soil for spectrophotometric analysis of hexavalent chromium. Test results indicated a concentration of 480 mg/kg (parts per million [ppm]) in the soil. Only one sample was collected. It was suggested that the area might have been a source of the contamination that had been observed in the groundwater.

1.4 CONTAMINANTS OF CONCERN

Based on the scope for the 100-D Area study, process knowledge, results from previous investigations, and documented observations of localized discolored soil, chromium was identified as the single contaminant of concern (COC). Hexavalent chromium was of primary concern due to its toxicity to fish in the Columbia River. Total chromium was of secondary concern and formed the basis for the laser-induced breakdown spectroscopy (LIBS) technology demonstration that was originally planned as Phase II of the 100-D Area chromium study. Other 100 Area COCs that are associated with the 100-DR-1 and 100-DR-2 source operable units were considered to be outside of the scope of the 100-D Area chromium study and were left to be addressed as part of existing remedial investigation/remedial action plans for the units.

™ Brunton is a tradename of the Brunton Company.

Figure 3. Surface Dichromate Stain at 190-D Complex.



2.0 STUDY OBJECTIVES/GOALS

The 100-D Area chromium study was performed in accordance with work plans and sampling and analysis instructions issued by Bechtel Hanford, Inc. (BHI). The objectives and goals of the study and the methodology used are documented in the subsections that follow.

2.1 CHROMIUM STUDY GOALS

Based on the stated objective, the goal for the study was to assess the concentration of chromium in soil at suspected locations of elevated contamination near the former 190-D Complex, the former sodium dichromate tank location at the 108-D Building, the sodium dichromate pumping station, and along the underground piping that interconnected them.

2.2 METHODOLOGY

Two phases were to be implemented to achieve the goal of the 100-D Area chromium study. Phase I of the study was to consist of collecting samples from test pits excavated in the upper 4 m (12 ft) of the vadose zone at the targeted locations. Samples collected from the test pits would then be analyzed for total and hexavalent chromium. Results from the test pits would be used to evaluate the level of chromium contamination in the soil and to support calibration of equipment for the second phase of the study. Phase II of the study was to involve a LIBS technology demonstration to collect in situ measurements of total chromium at greater depths in the vadose zone.

3.0 CHROMIUM STUDY INVESTIGATION PROCESS

The 100-D Area chromium study investigation process included performing geophysical surveys, excavating test pits, and collecting samples. Implementation of the LIBS technology demonstration was cancelled due to technical difficulties with the subcontractor's LIBS equipment. All field operations were performed in accordance with the health and safety requirements outlined in BHI-SH-01, *Hanford ERC Environmental, Safety, and Health Program.* A site-specific health and safety plan was also prepared for this study in accordance with BHI-MA-02, *ERC Project Procedures*.

3.1 GLOBAL POSITIONING SYSTEM SURVEY

A GPS survey was performed to identify nine Washington State plane coordinate locations (in meters) indicated in Figure 1 for the Phase I investigation activities. The coordinate locations corresponded to the documented position of underground piping that interconnected the former sodium dichromate pump station, the 190-D Complex, and 108-D Building facilities.

3.2 GEOPHYSICAL SURVEY

Prior to the initiation of field activities in the 100-D Area, ground-penetrating radar (GPR) and electromagnetic induction (EMI) surveys were performed and documented (BHI 1997d). The surveys were performed to confirm the position and identify any suspect breaks in the underground piping that interconnected the former sodium dichromate pump station, 190-D Complex, and 108-D Building facilities. The GPR survey was based on a 3 m by 3 m (10 ft by 10 ft) grid size, and the EMI survey was based on a 1.5 m by 1.5 m (5 ft by 5 ft) grid size.

3.3 TEST PIT INVESTIGATIONS

3.3.1 Project Readiness/Safety

A readiness assessment was performed and authorization to begin work for the Phase I of the study was provided, consistent with the requirements of BHI-MA-02, Procedure 8.2, "Readiness Assessments." Prior to the start of field activities, the BHI Safety delegate led a tailgate safety briefing. Phase I field operations were performed in accordance with a project-specific work plan/package and a site-specific health and safety plan.

3.3.2 Test Pit/Test Trench Excavation

A trackhoe was mobilized to the 100-D Area in late September 1997 to dig test pits at the locations depicted in Figure 4. The equipment was also used to dig a north/south trench through the documented sodium dichromate pipe trench in the 185-D Building. Target dig locations were selected using the following general considerations:

- Suspect weak points (e.g., in corners) in underground piping that was used to carry concentrated sodium dichromate solutions between buildings at the 190-D Complex.
- Documented areas where yellow staining of the soil had been observed (see Section 1.3.3).
- Around areas where concentrated sodium dichromate stock solutions were prepared, used, and/or stored and where spills or discharges to the soil may have occurred.

A total of seven test pits and one test trench were excavated, as depicted in Figure 4 and summarized in Table 1.

Figure 4. Test Pit/Trench Locations.

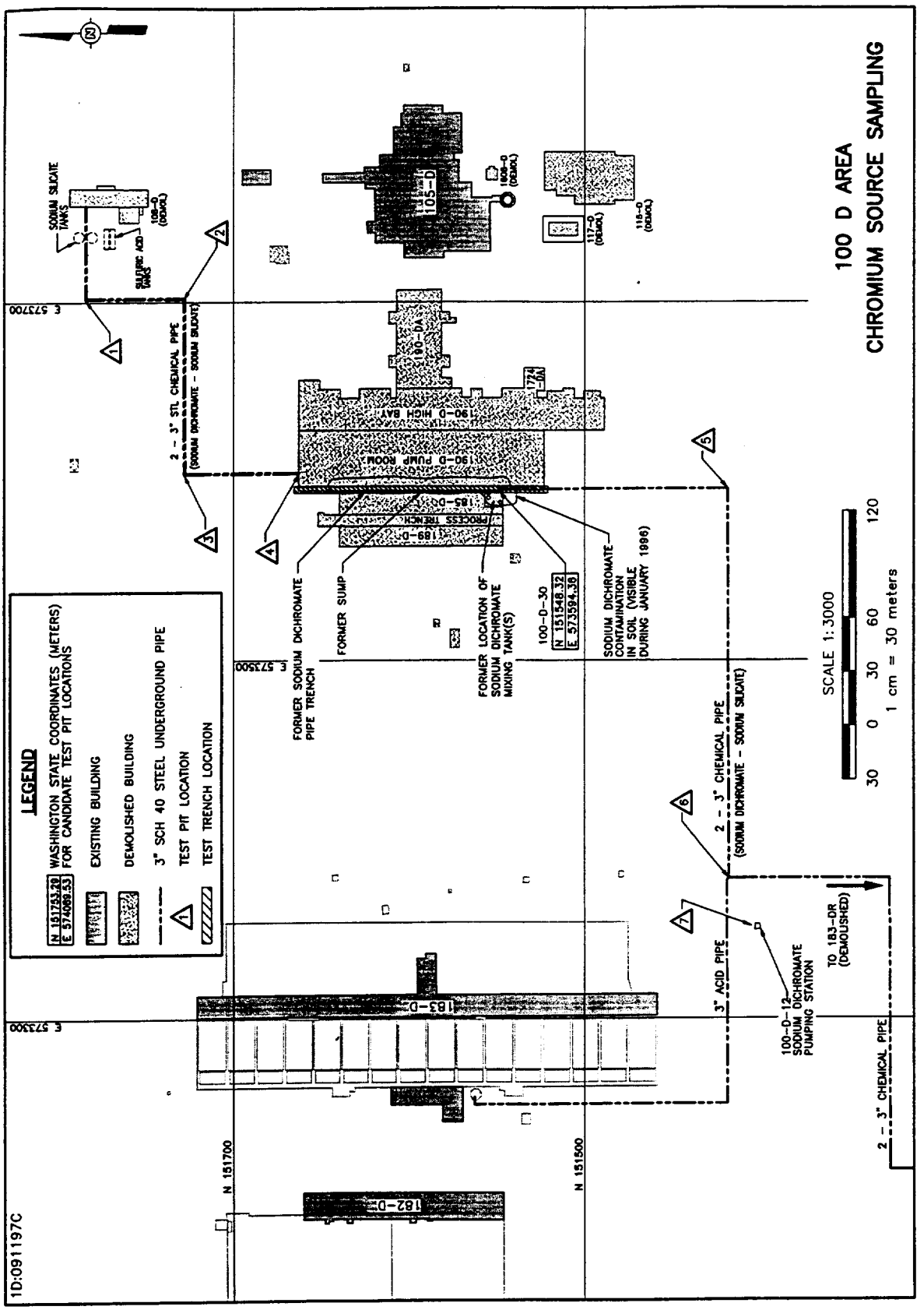


Table 1. Chromium Study Test Pit/Trench Summary.

#	Type	Northing	Easting	Depth (m)	Description/Comments
1	Pit	151,784	573,701	3	Chemical pipeline L (from east/to south)
2	Pit	151,727	573,701	4	Chemical pipeline L (north/west)
3	Pit	151,727	573,604	4	Chemical pipeline L (east/south)
4	Pit	151,662	573,604	4	Chemical pipeline interface with north side of 190-D complex
5	Pit	151,418	573,596	3	Chemical pipeline L (north/west)
6	Pit	151,418	573,378	4	Chemical pipeline L (east/south)
7	Pit	151,406	575,351	4.5	Waste site 100-D-12 (sodium dichromate pump station)
N/A	Trench	~151,530 to 151,662	~573,595	~4 to 5	Former sodium dichromate pipe trench (185-D). Trench included waste site 100-D-30 (location of previous visible sodium dichromate contamination) at N/E 151,548/573,594

N/A = not applicable.

During the excavation activities, the following observations were made:

- The specification for demolition of the 190-D Complex was 1 m (3 ft) below grade. Plans included excavation of a trench through the former sodium dichromate pipe trench using the west side of the foundation wall that served as an interface between the former 190-D and 185-D buildings as a guide. Although several east/west cross-cuts were made through the area, the foundation wall or the concrete floor was never located. As a result, the GPS survey locations were used to trench through the area according to the documented location of the pipe trench.

- The test trench was excavated through the demolition debris and into native soil. Isolated pieces of discolored demolition debris (e.g., concrete, clay pipe, and tile) were identified at the south end of the test trench around the documented location of previous yellow surface stains in the soil. The isolated pieces were estimated to represent less than 0.1 percent of the material excavated in the area. No soil discoloration was observed in the area. Personnel that observed the excavation activities who were present during the 190-D Complex demolition confirmed that the excavation was being performed in the correct area where visible contamination was observed during demolition.

- No soil discoloration was identified at any of the test pit/trench locations during excavation activities.

- Test pits were excavated at least 1 m (3 ft) below the lowest point of piping runs at each location. The chemical pipeline exposed at each test pit location appeared to be intact.

Samples were collected from each test pit and from various locations within the trench, as discussed in Section 4.0. Photographs of the soil, test pits, and the trench were taken during the excavation activities to document the process and provide a visual record of the study. Copies of

the photographs were provided to the LIBS representative to assist in preparation for the technology demonstration that was originally planned for Phase II of this study.

3.3.3 Site Restoration

Excavation areas were backfilled immediately after sampling was completed, and the areas were re-contoured to their original grade. A decontamination process was not used for the excavation bucket as there were no areas of visibly contaminated soil that were observed.

4.0 SAMPLING AND ANALYSIS

The sampling process design for Phase I was developed through the data quality objective process with participation from the Environmental Restoration Contractor (ERC); U.S. Department of Energy (DOE), Richland Operations Office (RL); and Washington State Department of Ecology (Ecology) representatives. The objective of the sampling design was to identify areas of elevated chromium concentrations in the soil that could be used by the groundwater and remedial action project teams to establish a source of the area groundwater contamination. The extent of elevated chromium contamination in the soil was not an objective of Phase I of the study. Results of the data quality objective process were reflected in the *Sampling and Analysis Instruction for the 100-D Area Chromium Study – Phase I* (SAI) (BHI 1997c).

4.1 SAMPLE COLLECTION

Samples were collected in accordance with the SAI (BHI 1997c) and BHI-EE-01, Procedure 4.0, "Soil and Sediment Sampling." Sampling activities were documented in field logbook EL-1425. Samples were collected from the middle areas of the excavation bucket with single-use, pre-cleaned plastic sampling equipment and were subsequently placed in pre-cleaned plastic containers of the appropriate size for onsite measurements, laboratory analysis, or LIBS calibration. Sample handling, shipping, and custody were performed in accordance with BHI-EE-01, Procedure 3.1, "Sample Packaging and Shipping"; Procedure 3.0, "Chain of Custody"; and Procedure 4.2, "Sample Storage and Shipping Facility." A sample collection and test results summary is presented in Appendix A.

4.2 SAMPLE ANALYSIS

Onsite measurements for hexavalent chromium were performed using a Hach DR/2000™ spectrophotometer in accordance with BHI-EE-05, *Field Screening Procedures*, Procedure 1.17, "Determination of Hexavalent Chromium in Water and Wastewater by the Hach DR/2000

™ Hach is a tradename of the Hach Company.

Spectrophotometer." The spectrophotometric test was preceded by a deionized water extraction, as described in the Appendix of the SAI (BHI 1997c). Laboratory samples were analyzed by Quanterra Environmental Services to determine the presence and concentration of total chromium and hexavalent chromium in accordance with U.S. Environmental Protection Agency SW-846 methods 6010A and 7196A, respectively (EPA 1986).

4.3 SAMPLE RESULTS

Hexavalent chromium concentrations in soil samples collected from the test pits and trenches ranged from 0.04 to 13.9 mg/kg. Most concentrations were less than 2 mg/kg. Results from isolated pieces of discolored demolition debris (e.g., concrete, clay pipe, and tile) that were identified at the south end of the documented 190-D Complex sodium dichromate pipe trench around the location of previous yellow surface stains in the soil were substantially higher. Hexavalent chromium concentrations of material scraped from the isolated pieces with the highest discoloration ranged from 4,390 to 5,420 mg/kg. Copies of the sample results for the onsite measurement tests and Quanterra analyses were provided to the LIBS subcontractor to support calibration of equipment for Phase II of the study. Results for all of the samples are summarized in the appendix of this document.

5.0 WASTE MANAGEMENT

Waste generated by the chromium study activities was managed in accordance with the SAI (BHI 1997c) and BHI-EE-10, *Waste Management Plan*. Waste generated in the field was collected and coordinated through Field Services Waste Management (FSWM) for appropriate designation and disposal. Prior to the start of work, site workers were briefed on the waste management requirements for the project. Management of individual waste streams is summarized below:

- Processed samples. Processed samples (e.g., water emptied from AccuVac™ ampuls) were collected in a plastic container, and marked as "WASTE PENDING LABORATORY ANALYSIS." After completion of the test pit investigations, a sample of the waste was collected and sent to Quanterra for total chromium analysis. Results were provided to FSWM for designation. In accordance with direction from FSWM, the waste was designated and disposed of as non-regulated material.

- AccuVac™ ampuls. Used AccuVac™ ampuls were emptied in accordance with *Washington Administrative Code* (WAC) 173-303 requirements, placed in their original styrofoam packaging, marked as "NONREGULATED" and "CONTAINS GLASS," and disposed of in a general trash container.

™ AccuVac is a tradename of Accutek, Inc.

- Contact waste. Solid waste consisting of sample containers, extraction vials, test tubes, pipette tips, spatulas, paper towels, disposable protective clothing and gloves, etc., were emptied in accordance with WAC 173-303 requirements (as applicable to containers), collected in plastic bags, marked as "NONREGULATED," and disposed of in a general trash container.

- Unused screening samples. Unused soil from onsite measurement tests was returned to the sample site.

The test pit investigation activities were not performed in areas of known radionuclude contamination, and no areas of unexpected contamination were encountered based on periodic surveys performed daily by radiological control technician representatives.

6.0 DISCUSSION

Elevated concentrations of chromium in soil were not identified at the locations and depths investigated during the Phase I activities performed in the vicinity of the former 190-D Complex, the former sodium dichromate tank location at the 108-D Building, the sodium dichromate pumping station, and along the underground piping that interconnected the facilities. Test pits/trenches were excavated in the shallow vadose zone to depths of 4 m (12 ft) to collect sample material and observe any soil discoloration that was present. Isolated pieces of discolored demolition debris (e.g., concrete, clay pipe, and tile) were identified at the south end of the documented 190-D Complex sodium dichromate pipe trench around the location of previous yellow surface stains in the soil. Hexavalent chromium concentrations of material scraped from the isolated pieces with the highest discoloration ranged from 4,390 to 5,420 mg/kg, as summarized in the appendix to this document. The isolated pieces were estimated to represent less than 0.1 percent of the material excavated in the area, but may provide an indication of the concentration of materials that were previously present in greater quantities.

Areas of soil discoloration were not observed at any of the 1997 test pit/trench locations during excavation activities. Personnel that observed the 1994-96 demolition of the 190-D Complex confirmed that the test pit investigation was being performed in the correct area where visible contamination was observed during demolition activities. The same personnel indicated that most discolored soil encountered during demolition of the 190-D Complex had been sent offsite for disposal. The chemical pipeline exposed at each test pit location appeared to be intact. Hexavalent chromium concentrations in soil samples collected from the test pits and trenches ranged from 0.04 to 18.4 mg/kg. Most concentrations were less than 2 mg/kg, as summarized in the appendix. These concentrations are not indicative of elevated soil contamination that could still be contributing to the groundwater plume at the concentrations that are being detected in the area wells discussed in Section 1.3. It may be possible that chromium contamination in the vadose zone has moved through the soil column to greater depths or that extensive areas of higher chromium concentrations exist at other locations that were not investigated during the Phase I activities.

Investigation of the vadose zone at greater depths using the LIBS technology was originally planned as Phase II of the study. The Phase II activities were cancelled due to technical difficulties with the subcontractor's LIBS equipment. A deeper investigation of the vadose zone using LIBS or some cost-effective methodology is recommended if there is an opportunity. In addition, a newly identified area has been identified for consideration of future investigation activities. Although there has been no documentation of soil discoloration in the area, the location of the former 183-DR headhouse and the chemical piping that fed the building may also be candidates for future investigation opportunities. Plans for additional investigation activities in the 100-D Area, including penetration of the soil column at greater depthsare under consideration for fiscal years 1999 through 2001.

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APPENDIX

SAMPLE RESULTS SUMMARY

100-D Area Chromium Study Sample Results Summary

SAMPLE INFORMATION					QUANTERRA			SCREENING	
date	location	northing/easting[a] (m)	depth (m)	matrix	ID#	Cr+6 (mg/kg) Q[b]	total Cr (mg/kg) Q[b]	ID#	Cr+6 (mg/kg) Q[b]
9/22/97	trench	~151,557/573,593	3	soil	B0M1C5	0.979	18.7	B0M1H5	2.48
9/22/97	trench	~151,557/573,593	4	soil	B0M1C6	6.96	39.6	B0M1H6	5.6
9/22/97	trench	~151,564/573,594	3	soil	B0M1C7	2.66	20.1	B0M1H7	3.44
9/22/97	trench	~151,558/573,595	3	concrete[c]	B0M1C8	4390 D^{200}	4240 D^{5}	B0M1H8	2240
9/23/97	trench	~151,585/573,594	3.5	soil	B0M1C9	1.54	15.5	B0M1J4	2.56
9/23/97	trench	~151,615/573,594	3.5	soil	B0M1D0	0.04	4.44	B0M1K4	0.1 U
9/23/97	trench	~151,600/573,594	3.5	soil	B0M1D1	0.1	5.72	B0M1J9	0.48
9/23/97	trench	~151,639/573,594	3.5	soil	B0M1D2	0.04	5.65	B0M1K8	0.1 U
9/23/97	trench	~151,427/573,596	3	soil	B0M1D3	0.12	4.91	B0M1L4	0.1 U
9/23/97	trench	~151,535/573,596	4	soil	B0M1D4	0.679	39.1	B0M1L2	0.4
9/24/97	trench	~151,547/573,595	3	concrete[c]	B0M1D5	5420 D^{500}	7.63	B0M1N0	720
9/23/97	trench	~151,547/573,596	4	soil	B0M1D6	0.4	13.4	B0M1L3	0.96
9/24/97	pit 5	151,418/573,596; north of L	2	soil	B0M1D7	13.9	1.17	B0M1L7	12
9/24/97	pit 5	151,418/573,596; south of L	2	soil	B0M1D8	1.68	0.5 U	B0M1L6	0.32
9/24/97	pit 6	151,418/573,378; south of pipe	4	soil	B0M1D9	0.1	0.5 U	B0M1M0	0.1 U
9/24/97	pit 6	151,418/573,378; north of pipe	4	soil	B0M1F0	0.1	0.5 U	B0M1L9	0.1 U
9/24/97	pit 7	151,406/573,351; east side	4.25	soil	B0M1F1	0.78	0.5 U	B0M1M2	0.4
9/24/97	pit 3	151,727/573,604; southeast of pipe	4	soil	B0M1F2	0.04	0.5 U	B0M1M4	0.1 U
9/24/97	pit 7	151,406/573,351; east side under drain	2.5	soil	B0M1F3	0.18	0.5 U	B0M1M3	0.4
9/24/97	pit 7	151,406/573,351; north side	4.25	soil	B0M1F4	0.04	0.5 U	B0M1M1	0.1 U
9/24/97	pit 3	151,727/573,604; southwest of pipe	4	soil	B0M1F5	0.06	0.5 U	B0M1M5	0.1 U
9/24/97	pit 1	151,784/573,701; west of pipe	3	soil	B0M1F6	0.08	0.5 U	B0M1M6	0.1 U
9/24/97	pit 1	151,784/573,701; east of pipe	3	soil	B0M1F7	0.04	0.5 U	B0M1M7	0.1 U
9/24/97	pit 2	151,727/573,701; east of L	4	soil	B0M1F8	0.04	0.5 U	B0M1M8	0.1 U
9/24/97	pit 2	151,727/573,701; west of L	3	soil	B0M1F9	0.1	0.5 U	B0M1M9	0.1 U
9/22/97	trench	~151,547/573,595	3	extract[d]	B0M1H9	2432 D^{500}	na	B0M1H8	2240
9/23/97	trench	~151,573/573,594	3.5	soil	na	na	na	B0M1J0	1.12
9/23/97	trench	~151,576/573,594	3.5	soil	na	na	na	B0M1J1	1.84
9/23/97	trench	~151,579/573,594	3.5	soil	na	na	na	B0M1J2	1.12
9/23/97	trench	~151,582/573,594	3.5	soil	na	na	na	B0M1J3	1.76
9/23/97	trench	~151,588/573,594	3.5	soil	na	na	na	B0M1J5	0.88
9/23/97	trench	~151,591/573,594	3.5	soil	na	na	na	B0M1J6	0.24
9/23/97	trench	~151,594/573,594	3.5	soil	na	na	na	B0M1J7	0.16
9/23/97	trench	~151,597/573,594	3.5	soil	na	na	na	B0M1J8	0.24
9/23/97	trench	~151,603/573,594	3.5	soil	na	na	na	B0M1K0	0.1 U
9/23/97	trench	~151,606/573,594	3.5	soil	na	na	na	B0M1K1	0.1 U
9/23/97	trench	~151,609/573,594	3.5	soil	na	na	na	B0M1K3	0.1 U
9/23/97	trench	~151,621/573,594	3.5	soil	na	na	na	B0M1K5	0.1 U
9/23/97	trench	~151,627/573,594	3.5	soil	na	na	na	B0M1K6	0.1 U
9/23/97	trench	~151,633/573,594	3.5	soil	na	na	na	B0M1K7	0.1 U
9/23/97	trench	~151,645/573,594	3.5	soil	na	na	na	B0M1K9	0.1 U
9/23/97	trench	~151,651/573,594	3.5	soil	na	na	na	B0M1L0	0.1 U
9/23/97	trench	~151,657/573,594	3.5	soil	na	na	na	B0M1L1	0.1 U
9/24/97	pit 5	151,418/573,596; spoil pile	2.5	soil	na	na	na	B0M1L5	18.4
9/24/97	pit 6	151,418/573,378; top of pipe	2	soil	na	na	na	B0M1L8	0.1 U

Notes:

[a] Northing/Easting information for trench locations are estimated based on GPR survey report, IOM number 051508.

[b] Concentration Qualifiers

U - Not detected. The associated value is the quantitation limit for the sample.

D - Sample result reported after dilution. Dilution factor indicated by superscript value.

[c] Sample consisted of pulverized stained concrete piece.

[d] Sample B0M1H9 was the screening extract of sample B0M1H8.

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